Food vibrations

Jeremy Thomson discovers how honey bees work out their work-mates' dances in the dark.
26 April 2000

JEREMY THOMSON

By performing a high-speed jig known as a 'waggle dance', a honeybee (*Apis mellifera*) can inform its work-mates of new food sources, describing in great detail the distance and direction they must follow to get there. This dance is well understood. More mysterious is how other bees get the message in the dark of the hive.

Now research by James Nieh and Jürgen Tautz of the University of Würzburg, Germany indicates that the message passes from one bee to another, not through the air as light or sound, but as vibrations in the honeycomb.

A worker bee that has discovered some tasty flowers will gather a little food, then make a 'beeline' back to the nest to recruit helpers -- this way more food can be collected more quickly than if the insects forage independently. Back at the hive, they dance in a figure-of-eight pattern, wiggling their bodies from side to side around fifteen times a second (15 Hz) and buzzing their wings in short bursts.

The middle part of their dance, the 'straight run', describes where to find the nectar -- the length of the run indicates the distance to it, and the angle to the vertical is thought to reflect the angle relative to the sun that the foragers need take to get there.

But how do other bees follow the dance? It's dark inside the hive and they probably can't hear the buzzing of the dancer over the hubbub. The odour and temperature of the incoming bee may be important, but these elements can't give the full picture.

The obvious answer is that the vibrations of the dance reach the spectators via the honeycomb itself. But while the 15-Hz body-shake transmits well through the comb, the 200--300-Hz wing buzz doesn't. The 15-Hz signal alone can't describe the dance, as it is present throughout, not just on the 'straight run'. Besides, bees are not thought to be able to detect these low frequencies.

Yet, other clues point to vibrations being important. Bees usually dance on open, rather than sealed honeycomb cells, which transmit vibrations better. Also, combs that are attached to the sides of the hive are poor sounding boards, and bees appear deliberately to detach combs in exactly the areas of the hive where dances are made.

Nieh and Tautz constructed an elaborate artificial hive to

¥**Radiation zaps bystanders**
4 December 2001

¥**Quantum computers spread the risk**
4 December 2001

¥**The littlest lizard**
3 December 2001

¥**Good vibrations**
3 December 2001

¥**Exercising your genes**
3 December 2001

measure comb vibrations with a sensitive laser detector. As they report in the *Journal of Experimental Biology*[1], they took accurate visual and mechanical measurements from the comb next to waggle-dancing bees. They spotted a faint 220-290-Hz signal just emerging from the background noise which was present only on the 'straight run' part of the dance.

This vibration may well be enough for other bees decipher the dance. But why is it so faint? The researchers propose that this is intentional: a dancing bee needs to attract only a few nearby nest-mates to collect food. If the vibrations were too loud, they would spread across the comb, causing confusion and an unnecessary racket.

Next Nieh and Tautz hope to discover exactly how bees pick out these faint messages from the noise. The creatures sense vibrations using their legs, and the researches postulate that bees might filter out noise and locate a dancer by comparing the signals reaching each of their six legs.

References

1. Nieh, J. C. & Tautz, J. Behaviour-locked signal analysis reveals weak 200--300 Hz comb vibrations during the honeybee waggle dance. ***Journal of Experimental Biology*** **203**, 1573 (2000)